

ATTACHMENT 5

SPECIAL TOOLS AND TEST EQUIPMENT

FOR

**PROCUREMENT OF 40 FT LOW-FLOOR
BATTERY ELECTRIC BUSES**

SPECIFICATION NO. VE21-054



Massachusetts Bay Transportation Authority
Vehicle Engineering
Boston, Massachusetts

The Contractor shall refer to Technical Specification VE21-054 and all TS Attachments for special tool and test equipment requirements. The Contractor shall include a list of all special tools and test equipment with their proposal.

A. Special Tools

Any special tools, jigs, fixtures, adapters, environmental systems required for maintenance and repair of the buses shall be supplied by the Contractor. "Special Tools" is defined as tooling produced specifically for bus maintenance and repair and not readily available from hardware store or Snap-On. Example of standard tools are combination wrenches, screws drivers, hammers or tools would normally be found in a mechanic toolbox. Example of special tools are temperature adapter, tachometer readers, valve driver, pressure probe, laptops with all appropriate diagnostic software installed, training smart boards, etc

A minimum of ten sets of special tools shall be provided and delivered prior to arrival of the first production bus. Special tools include any that are required to perform tasks in high voltage compartments (1000 volts). At a minimum the tool sets shall include high voltage/insulated screwdrivers, sockets, rachets, extensions, combination wrenches, plier assortment.

Ten Fluke DVOM meters and lead sets, with a minimum Category 3 rating, shall be provided by the Contractor prior to the arrival of the first production bus.

Ten Fluke 1587 megohm meters and lead sets shall be provided by the Contractor prior to the arrival of the first production bus.

A minimum of 20 sets of ANSI and NFPA high voltage certified PPE including inner and outer gloves, glove inflator, pull sticks, face shields, and aprons shall be provided by the Contractor with the delivery of the first pilot bus. All high voltage gloves shall be delivered to the Authority in their original unopened packages and have a date code indicating no more than one month of age (eleven months useable). Two sets of PPE shall be provided with each of the ten tool sets (20 PPE sets total)

As part of the maintenance-training program one (1) complete set of all special tools and test equipment, necessary to service and maintain each bus system, shall be provided prior to the delivery of the Pilot Bus.

Additionally, drawings, and documentation shall also be provided. A complete list of all special tools shall be included in the bidding documents.

B. Test Equipment

For each bus system, the Contractor shall furnish all test equipment and instructions required to perform testing necessary to verify proper operation and to diagnose failures. Diagnostic test equipment and methods shall be designed to isolate defects to the lowest replaceable component level in the shortest practical time. The detailed functions and design of all test equipment shall be approved by the Authority during the design review process. All on-board computer equipment shall be user-friendly and shall have English-language and decimal messages display.

The Contractor shall provide twenty (10) semi-ruggedized laptops, Dell Latitude E6430 ATG or approved equal, of the latest commercially available configuration.

The Contractor shall provide all software and related hardware/peripheral equipment required in Technical Specification VE21-054 and as identified in all Technical Specification Attachments.

The Contractor shall provide and install all software and apps on all Contractor provided computers prior to delivery. Only OEM component /systems software shall be provided. At a minimum, each Contractor provided laptop shall be furnished with:

- Microsoft 365 Business Standard
- Adobe Creative Cloud for Business
- Anti-Virus software
- All bus component/systems diagnostic and fault detection software, with read write capabilities as required in the Technical Specification, and as applicable to the proposed bus configuration, such as
 - Propulsion system
 - ESS system
 - High voltage battery management system
 - Low voltage battery management system
 - Appropriate thermal management system diagnostic software such as
 - EMP Power Connect
 - Modine E-Fan Diagnostic software
 - Wabco Toolbox
 - HVAC system diagnostic software such as
 - TK CANDiag
 - Multiplex system such as
 - CAN King Kvaser software and DLA driver
 - VMM Vansco Multiplex software and DLA driver
 - Auxiliary Heater diagnostic software
 - Destination sign
 - Audible alarm annunciator (operator seat etc)

The Contractor shall provide ten (10) Nexiq USB Link-2 Bluetooth interface modules and appropriate cables; and install all drivers on each Contractor provided laptop prior to delivery.

The Contractor shall also provide ten (10) PCAN-Diag 2 diagnostic units (with all cables and accessories required for bus connection), and provide/load all configuration and conversion software, and any drivers onto each laptop.

All Contractor provided data communication equipment shall be RP1210 compliant.

All software and app subscriptions shall be transferable to new laptops should the original laptop be damaged or replaced.

The Contractor shall be responsible for all software, app, and subscription costs, to include updates and changes to all software and apps (example: Office 365 change to Microsoft 365) for the buses designed life expectancy of 14 years to be calculated from the date the last production bus was accepted by the Authority.

Any software subscription costs shall be included in the original contract price and shall not be affected by any sub-supplier policy changes.

Contractor shall supply all necessary peripheral equipment for each laptop to be capable of interacting with the bus to obtain all required diagnostic information.

The laptops shall be capable of interfacing with all bus systems. For any systems requiring special interface equipment the Contractor shall provide ten (10) sets of interface / test equipment.

One full set of all test equipment shall be provided with the delivery of the first pilot bus. The remaining nine sets of test equipment shall be delivered prior to arrival of the first production bus. The Contractor shall submit a complete list of all Test Equipment with recommended quantities and specifications of each type of equipment to the Authority for approval during the design review process.